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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/041,838	01/07/2002	Arnold V. Kholodenko	6408	5502

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APPLIED MATERIALS, INC.
2881 SCOTT BLVD. M/S 2061
SANTA CLARA, CA 95050

EXAMINER	
VINH, LAN	

ART UNIT	PAPER NUMBER
1765	

DATE MAILED: 03/10/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/041,838	KHOLODENKO ET AL.	
	Examiner	Art Unit	
	Lan Vinh	1765	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *09 February 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-59* is/are pending in the application.

4a) Of the above claim(s) *52-59* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-12, 18-30,33-42, 45-51* is/are rejected.

7)☒ Claim(s) *13-17,31,32,43 and 44* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date *022704*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election with traverse of Group I, claims 1-51 in Paper No. 0204 is acknowledged. The traversal is on the ground(s) that there would not be a serious burden on the examiner to perform the search since the apparatus as claimed can only be used to perform the methods that are the subject of the claims in group I. This is not found persuasive because as indicated in the restriction letter, claims 1-51 (drawn to a method) clearly require a search in the 438 class/method class whereas claims 52-59 (drawn to an apparatus) require a search in the 156 class/apparatus class. Thus, the examiner asserts that there would be a serious burden on the examiner to perform the search in both 438 and 156 classes. In addition, although the applicants argue that the apparatus as claimed can only be used to perform the methods that are the subject of the claims in group I, the applicants have not proved that the apparatus as claimed can not be used to perform another method such as a PECVD process as proposed by the examiner.

The requirement is still deemed proper and is therefore made FINAL.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1-5, 7-12, 18-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collision et al (US 6,203,657) in view of Langan et al (US 5,413,670)

Collision discloses a method for plasma etching in a plasma module/reactor, the module/reactor having a wafer supporting chuck 120/wafer support pedestal, one RF power source 226 applied to the module, an exhaust pumping port 110 and the module is used for residue stripping (col 9, lines 17-20, fig. 3). This method comprises the steps of:

injecting a feed gas compound of NF3/ etch species in a secondary chamber 202, the injecting gas may contains fluorine species is largely separated from the high ions (col 7, lines 45-47, col 9, lines 35-38), passing the feed gas/etch species from the chamber 202 into the processing chamber 204 (fi.3), in one embodiment the feed gas is dissociated into various species including electrons (col 8, lines 49-51), which reads on producing free ions in said wafer processing chamber so as to convert the molecules of said etch species into ions of said etch species by electron attachment

Unlike the instant claimed invention as per claim 1, Collision does not specifically disclose ionizing the NF3/ electro-negative etch species to form atomically free form of etch species.

Langan, in a method of plasma etching, discloses that the fluorine atoms in the NF3 are electronegative resulting in a high concentration of negative fluoride ions in the plasma, NF3 can generate a greater free fluorine atom concentration in plasma (col 4, lines 50-58), which reads on the step of ionizing the NF3/ electro-negative etch species to form atomically free form of etch species.

Hence, one skilled in the art would have found it obvious to modify Collision by adding the step of ionizing the NF3/ electro-negative etch species to form atomically free form of etch species as per Langan because according to Langan, the NF3 can generate a greater free fluorine atom concentration in a plasma leading to generally faster etch or clean rate using NF3 (col 4, lines 50-53)

Regarding claim 2, Collision discloses introducing N2/inert gas (claimed electron donor gas into the chamber and applying RF power to the processing chamber (col 9, lines 23-25, fig. 3)

Regarding claim 3, Colllision discloses that much of the RF energy is input into ionization at the expense of dissociation of the feed gas (col 2, lines 28-30). Regarding claims 4-5, Collision's NF3 gas contains fluorine/halogen group, Collision also discloses flowing N2/inert gas into the chamber (col 9, lines 24-25). Regarding claim 7, Collision discloses that the chamber 202 is next to the processing chamber 204, the gas is passed through a passageway between the chambers (fig. 3). Regarding claims 8, 9, Fig. 3 of Collision shows a gas inlet/injector 108 and the gas is feed through a baffle 124/gas manifold. Regarding claim 10, Collision discloses flowing the feed gas through a tube between the two chambers 202 and 204 (fig. 3). Regarding claim 11, Collision discloses that the feed gas is dissociated into plasma in primary zone 116 prior to being flown into the processing chamber 204. Regarding claim 12, Fig. 3 of Collision shows that the feed gas is flown into the chamber 202 in a direction away from the exhaust/vacuum port 110. Regarding claim 18, Collision discloses using two RF power

supply sources 114 and 226. Regarding claim 19, Collision discloses connecting the RF power source to a biasing arrangement/floating potential (fig. 3)

4. Claims 6, 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collision et al (US 6,203,657) in view of Langan et al (US 5,413,670) and further in view of Higuchi et al (US 5,783,492)

Collision as modified by Langan has been described above. Collision and Langan differ from the instant claimed inventions as per claims 6, 25 by using an inert gas of N2 instead of helium.

However, Higuchi, in a method of plasma etching, discloses that nitrogen and helium can be used as inert gas in plasma processing (col 13, lines 1-5)

Hence, one skilled in the art would have found it obvious to substitute Collision and Langan nitrogen/inert gas with helium in view of Higuchi's teaching because Higuchi discloses that helium or nitrogen can be properly selected as an inert gas in accordance with the type of plasma processing gas (col 13, lines 5-7)

5. Claims 20-24, 26-30 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collision et al (US 6,203,657) in view of Langan et al (US 5,413,670)

Collision discloses a method for plasma etching in a plasma module/reactor, the module/reactor is used for residue stripping (col 9, lines 17-20, fig. 3). This method comprises the steps of:

injecting a feed gas compound of NF3/ etch species in a secondary chamber 202 to produce plasma, the injecting gas may contains fluorine species is largely separated from the high ions (col 7, lines 45-47, col 9, lines 35-38), passing the plasma from the chamber 202 into the processing chamber 204 (fi.3), in one embodiment the feed gas is dissociated into various species including electrons in the processing chamber (col 8, lines 49-51), flowing nitrogen gas/inert gas/claimed electron donor gas in conjunction with the feed gas into the wafer processing chamber (col 9, lines 16-26)

Unlike the instant claimed invention as per claim 20, Collision does not specifically disclose that the NF3 is an electro-negative etch species

Langan, in a method of plasma etching, discloses that the fluorine atoms in the NF3 are electronegative resulting in a high concentration of negative fluoride ions in the plasma (col 4, lines 50-58).

Hence, one skilled in the art would have found it obvious to modify Collision by using the NF3 gas as an electro-negative etch species as per Langan because according to Langan, the NF3 can generate a greater free fluorine atom concentration in a plasma leading to generally faster etch or clean rate using NF3 (col 4, lines 50-53)

The limitations of claims 21-24 have been discussed above.

Regarding claim 26, Collision discloses that the plasma is passed through a passageway between the chambers 202 and 204 (fig. 3). Regarding claim 27, fig. 3 of Collision shows that the plasma is confined within the sidewall of the chamber. Regarding claim 28, fig. 3 of Collision shows a injection nozzle 100 adjacent to the sidewall of the chamber. Regarding claim 29, fig. 3 of Collision shows the plasma is

injected into the processing chamber in a direction parallel to the sidewall of the chamber. Regarding claim 30, Fig. 3 of Collision shows the plasma is feed through a baffle 124 having a plural gas injection passages.

6. Claims 33-42, 46-51 are rejected under 35 U.S.C. 103(a) as being unpatentable over Collision et al (US 6,203,657) in view of Langan et al (US 5,413,670)

Collision discloses a method for plasma etching in a plasma module/reactor, the module/reactor is used for residue stripping (col 9, lines 17-20, fig. 3). This method comprises the steps of:

injecting into the processing chamber 204 a feed gas compound of NF3/ etch species produced in a secondary chamber 202/external source, the injecting gas may contains fluorine species is largely separated from the high ions (col 7, lines 45-47, col 9, lines 35-38), in one embodiment the feed gas/etch species is dissociated into various species including electrons in the processing chamber (col 8, lines 49-51),

Unlike the instant claimed invention as per claim 33, Collision does not specifically disclose that the NF3/etch species is an electro-negative etch species

Langan, in a method of plasma etching, discloses that the fluorine atoms in the NF3 are electronegative resulting in a high concentration of negative fluoride ions in the plasma (col 4, lines 50-58)

Hence, one skilled in the art would have found it obvious to modify Collision by using the NF3 gas as an electro-negative etch species as per Langan because according to Langan, the NF3 can generate a greater free fluorine atom concentration in a plasma leading to generally faster etch or clean rate using NF3 (col 4, lines 50-53)

Regarding claims 34, 37, Collision discloses flowing an inert gas/claimed electron donor gas into the chamber (col 9, lines 24-25)

Regarding claims 35, 36, Collision's NF3 gas reads on the stable gas compound comprises a compound of F/halogen element and N/a non-metal element

Regarding claim 38, Collision discloses flowing the NF3 gas through an inlet/port between the two chambers 202 and 204 (fig. 3)

Regarding claim 39, fig. 3 of Collision shows that the gases are confined within the sidewall of the chamber.

Regarding claim 40, fig. 2B of Collision shows two gas ports 222/injection nozzles adjacent the sidewall of chamber 204. Regarding claims 41-42, Fig. 2B of Collision shows that the feed gases are flown into the chamber 204 in two gas ports in a direction nearly parallel with the sidewall. Regarding claim 46, fig. 2B of Collision shows that additional feed gas is injected through gas port into the chamber 204. Regarding claims 48-50, Collision discloses using two RF power supply sources 114, 226 and connecting the RF power source to a biasing arrangement/floating potential (fig. 3)

7. Claim 45 is rejected under 35 U.S.C. 103(a) as being unpatentable over Collision et al (US 6,203,657) in view of Langan et al (US 5,413,670) and further in view of Aoki et al (US 5,581,874)

Collision as modified by Langan has been described above. Unlike the instant claimed invention as per claim 45, Collision and Langan do not specifically disclose injecting the electron donor gas through gas passages in a wafer support pedestal.

Aoki discloses a method for forming a bonding portion comprises the step of injecting an inert gas of helium/ claimed electron donor gas through gas passages in a wafer support pedestal (fig. 5)

Hence, one skilled in the art would have found it obvious to modify Collision and Langan by injecting an inert gas of helium/ claimed electron donor gas through gas passages in a wafer support pedestal to supply a heat transmission to bottom surface of wafer as taught by Aoki (col 10, lines 50-52)

Allowable Subject Matter

8. Claims 13-17, 31-32, 43-44 objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter:

Regarding claims 13, 31, 43, the cited prior art of record fails to disclose injecting an etch species in a secondary plasma chamber into the wafer processing chamber in a direction away from the pumping port/ injecting plasma product into the wafer processing chamber in a direction opposite to the direction of the gas evacuation toward the pumping port. In the contrary, the closest cited prior art of Collision et al (US 6,203,657) discloses injecting an etching gas/etch species in a secondary plasma chamber 202 into the wafer processing chamber 204 in a direction toward the exhaust/ pumping port 110 (fig. 3)

Conclusion

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lan Vinh whose telephone number is 571 272 1471. The examiner can normally be reached on M-F 8:30-5:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nadine Norton can be reached on 571 272 1465. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

LV
March 1, 2004